PedCath8

Reference

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PedCath Formula Reference

Body Surface Area—Dubois and Dubois height-weight equation

Units: Weight in Kg, Height in cm (Yang et al., page 42).

$$BSA\ (cm^2) = Wt^{.425} \times Ht^{.725} \times 71.84$$

Convert BSA (cm^2) to BSA (m^2):

$$BSA\ (m^2) = \frac{BSA(cm^2)}{10000} = \frac{BSA(cm^2)}{100 \times 100}$$

O_2 Capacity

The default factor is 1.36 (Yang et al., page 45).

$$O_2\ capacity = HB \times 1.36$$

PedCath uses 1.36 as the default multiplication factor for O_2 Capacity; however, the attending physician may set an alternate multiplier: 1.36 (default), 1.34 or 1.39.

The 1.39 multiplication factor is referenced in Saksena, page 30.

To change the multiplier, you must log in as an administrator and select:
        `Tools-Options-Administrator-Calculations.`

Multipliers are the responsibility of the cath lab medical director.

MV, SA, PA and PV O_2 Content

Referenced as PO_2 x 0.003026 in Yang et al., page 45. **PedCath** rounds to 0.003.

a) If PO_2 not measured

$$O_2\ content = O_2\ capacity \times O_2\ sat$$

b) If PO_2 measured:

$$O_2\ content = O_2\ capacity \times O_2\ sat + (.003 \times PO_2)$$

Oxygen Consumption

Two different Oxygen Consumption calculations are available in *PedCath*:

a) Assumed Oxygen Consumption—LaFarge method

Please Note: This method can only be used for patients whose age and heart rate fall within defined limits. Data for gender, heart rate and age are required. Age is calculated as *Cath date - Date of birth*. O_2 consumption is calculated in $(ml/min)/M^2$. (LaFarge, et al., pages 23-30)

For Males:

$$O_2 \text{ Consumption } (ml/min/m^2) = 138.1 - (11.49 \times \log_e(age \text{ in years})) + (0.378 \times (heart \text{ rate}))$$

For Females:

$$O_2 \text{ Consumption } (ml/min/m^2) = 138.1 - (17.04 \times \log_e(age \text{ in years})) + (0.378 \times (heart \text{ rate}))$$

b) Assumed Oxygen Consumption—Seckeler method

Please Note: This method can be used for patients of any age. Data for age (years), weight (kg), single ventricle anatomy, and critical illness (ICU status) are required. Single ventricle and critical illness are dichotomous variables (given a value of 1 for yes and 0 for no). Age is calculated as *Cath date - Date of birth*. O_2 consumption is calculated in $(ml/min)/M^2$.

$$O_2 \text{ Consumption } (ml/min/m^2) = 242.1 + (9.7 \times \log_e(age \text{ in years}))$$
$$-(34 \times \log_e(weight)) - (9.6 \times single \text{ } ventricle) - (11.2 \times critical \text{ } illness)$$

c) Indexing a measured value

If a measured value is available, use the Oxygen consumption Calculator to convert the measurement to an indexed value. The calculator uses the following formula:

$$O_2 \text{ Consumption } (ml/min/m^2) = \frac{O2 \text{ Consumption (absolute)}}{BSA}$$

Cardiac Output (Qp and Qs)

Cardiac Index Calculation (Yang et al., page 44):

$$Qp \text{ } (liters/min/m^2) = \frac{O_2 Consumption \text{ } (ml/min/m^2)}{(PV - PA \text{ } content) \times 10}$$

$$Qs \text{ } (liters/min/m^2) = \frac{O_2 Consumption \text{ } (ml/min/m^2)}{(SA - MV \text{ } content) \times 10}$$

Cardiac Output Calculation (Yang et al., page 45):

$$Qp \text{ } (liters/min) = Qp \text{ } (liters/min/m^2) \times BSA$$

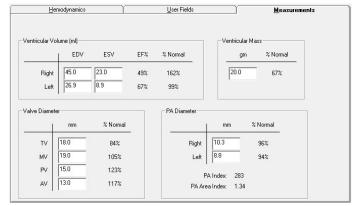$$Qs \text{ } (liters/min) = Qs \text{ } (liters/min/m^2) \times BSA$$

Resistance (Rp and Rs)

Wood's Resistance Unit, also called Hybrid Resistance Unit (Yang et al., page 68):
Wood's Unit = mm Hg min. liter $^{-1}$ or [(mm Hg)/(liter/min.)]
(Pressures in mm Hg; Flow in liter/min./m^2; Resistance in Wood's Units.)

$$Rp\,(indexed) = \frac{mean\ MPA - PA\ wedge}{Qp} \qquad\qquad Rp\,(abs) = \frac{Rp\,(indexed)}{BSA}$$

$$Rs\,(indexed) = \frac{mean\ Sys - mean\ RA}{Qs} \qquad\qquad Rs\,(abs) = \frac{Rs\,(indexed)}{BSA}$$

New Calculations in **PedCath**

PedCath8 offer several sets of calculations that were not part of the standard **PedCath3** configuration. These new features can be found under the Measurements tab in the **PedCath** edit screen.

Hemodynamics				User Fields				**Measurements**

Ventricular Volume (ml)

	EDV	ESV	EF%	% Normal
Right	45.0	23.0	49%	162%
Left	26.9	8.9	67%	99%

Ventricular Mass

	gm	% Normal
	20.0	67%

Valve Diameter

	mm	% Normal
TV	18.0	84%
MV	19.0	105%
PV	15.0	123%
AV	13.0	117%

PA Diameter

	mm	% Normal
Right	10.3	96%
Left	8.8	94%

PA Index: 283
PA Area Index: 1.34

Ejection Fraction

$$Ejection\ Fraction\ (\%) = \frac{End\ Diastolic\ Volume - End\ Systolic\ Volume}{End\ Diastolic\ Volume} \times 100$$

PA Index (PAI)

$$PAI = \Pi \times \frac{\left[\frac{RPA}{2}\right]^2 + \left[\frac{LPA}{2}\right]^2}{BSA}$$

PA Area Index (PAAI)

$$PAAI = \Pi \times \frac{\left[\frac{RPA}{2}\right]^2 + \left[\frac{LPA}{2}\right]^2}{(279.89 \times BSA) - 35.46}$$

References:

Yang SS, Bentivoglio LG, Maranhao V, Goldberg H. *From Cardiac Catheterization Data to Hemodynamic Parameters*. 3rd ed. Philadelphia, PA: F.A. Davis Company; 1988

Saksena FB. *Hemodynamics in Cardiology: Calculations and Interpretations*. Westport, CT: Preager Publishers; 1983

LaFarge CG, Miettinen OS. The estimation of oxygen consumption. *Cardiovasc Res.* 1970;4(1):23-30.

Seckeler MD, Hirsch R, Beekman RH 3rd, et al. A new predictive equation for oxygen consumption in children and adults with congenital and acquired heart disease. *Heart.* 2015;101(7):517-524.

Graham TP Jr, Jarmakani JM, Canent RV Jr, et al. Left heart volume estimation in infancy and childhood. Reevaluation of methodology and normal values. *Circulation.* 1971;43(6):895-904.

Graham TP Jr, Jarmakani JM, Atwood GF, et al. Right ventricular volume determinations in children. Normal values and observations with volume or pressure overload. *Circulation.* 1973;48(1):144-53.

Nakata S, Imai Y, Takanashi Y, et al. A new method for the quantitative standardization of cross-sectional areas of the pulmonary arteries in congenital heart diseases with decreased pulmonary blood flow. *J Thorac Cardiovasc Surg.* 1984;88(4):610-9.

PedCath Logging

PedCath tracks cath views and edits in compliance with the Health Insurance Portability and Accountability Act (HIPAA). When a user opens the PedCath Edit screen, PedCath will log information about the cath that was viewed, the staff member who viewed it and the date and time (either the local or server time can be used based on your settings). If the staff member edits and saves the cath then PedCath will log this as well.

PedCath also logs anything exported from the system such as when any reports are printed, saved, or emailed. This includes the main PedCath report, a report from the data reporting module, the staff listing report, or a patient's billing information.

The export log keeps track of the staff member, export date and time, and export location for each type of export. The following shows the types of export actions logged and additional information saved.

Export Actions Logged	**Additional information logged**
Printed the PedCath report	Printer location
Saved the PedCath report to a file	Export location, file name
Emailed the PedCath report	Mail recipients (To: and CC:)
Printed data reports results	Query and printer location
Saved data reports results to a file	File name and query
Emailed data reports results	Mail recipients (To: and CC:) and query
Printed a patient's billing information	Printer location
Printed a patient's document	Document title, file name, and printer location
Printed the staff listing	Printer location
Exported a patient's document	Document title and file name
Locked a cath report	none
Unlocked a cath report	none
Cath report unlocked due to HL7 NACK	none
Cath report unlocked due to HL7 timeout	none
Cath report unlocked due to export error	none
Viewed a backup cath report	Backup ID
Submitted a study	Study name and study ID
Unlocked a study	Study name, study ID, and follow-up title if applicable.
Printed HIPAA log	Report description printer location
Ran batch export	Path, log file, export file type, total number of cases

Moved a cath report to a different patient record	Patient MRN, name, and id of both patient records.
Ran the IMPACT submission	Quarter and year of the submission, and whether patient identifying fields were included or not.
Successful Login, Unsuccessful Attempt, and Logout	Host and username
Deleted cath report	None
Deleted patient record	Patient name and ID.
Added new staff record	Staff ID, username, and display
Disabled staff record	Staff ID, username, and display
Deleted staff record	Staff ID, username, and display
Reactivated staff record	Staff ID, username, and display
Edited a staff record's ID fields (display name, login, hospital staff ID, NPI, LDAP ID), password reset, or changed permission level	Staff ID, username, and display, and id fields that changed.
Received a PedCath Error	Error number and description
Imported data from hemodynamics system into a new cath report.	Hemodynamics file name
Imported data from hemodynamics system into an existing cath report.	Hemodynamics file name
Flagged patient for archival	Whether the flag was added or removed. Patient name and MRN.
Archived patient	Patient name, MRN, birth date, ID
Retrieved patient from archive	Patient name, MRN, birth date, ID

PedCath logging data may be viewed from within the Administrative console on the "View HIPAA" tab.

The Diagnostic Code Set

The standard PedCath *code set – Summary*

If you choose, you may include codes in your **PedCath** cath reports to indicate cardiac and non-cardiac diagnosis, ECG findings, cath procedures, cath complications, surgery and pharmaceutical interventions.

The standard version of the program includes a set of codes developed for this purpose by **Scientific Software Solutions** and our medical advisors. We have found these codes to be complete, without burdening the user with excessive detail.

We are aware that no universally accepted set of codes exists for pediatric caths. Different institutions use different coding systems, and some do not use a coding system at all.

Our goal is to help you to do your work, your way. If you do not enter diagnosis codes, there will be no loss of functionality in **PedCath**. The list of codes simply will not appear in the printed report.

Optional Code Sets

If you wish to use an alternate code set, we can offer optional sets from some of the major pediatric hospitals. Currently, we have hierarchical coding systems available from the following institutions (all rights reserved by the developing institutions):

> **Hospital for Sick Children** – Toronto, Canada
>
> **Texas Children's Hospital** – Houston, Texas
>
> **Boston Children's Hospital** – Boston, Massachusetts

Please call Scientific Software Solutions if you need assistance in creating an optional code set for your hospital. We can provide limited technical assistance in testing code set compatibility, and may be available on a contractual basis to customize **PedCath** to your individual needs.

It is important to select a code set before entering patient data.

If you would prefer to use an optional code set, we recommend that you use it from the start. This will avoid any need to convert old patient records at a later date.

IMPACT Registry Code Set

If your institution participates in the IMPACT Registry, the IMPACT code set for procedures, surgeries, diagnosis and events will be available for coding within the IMPACT Registry module. PedCath will also allow you to use those codes for the PedCath report if you choose. This can be easily configured with an administrative setting. When doing so the codes entered for the cath report will automatically transfer to the IMPACT module eliminating the need for cross-coding.

A complete listing of the Diagnostic Codes
selected by your hospital follows this page.